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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,946	07/28/2003	Daniel A. Kearl	10019358-1	9103

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EXAMINER

WILLIAMS, SHERMANDA L

ART UNIT PAPER NUMBER

1745

DATE MAILED: 07/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/628,946

Applicant(s)

KEARL ET AL.

Examiner

Shermanda L. Williams

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-64 is/are pending in the application.
- 4a) Of the above claim(s) 36-64 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6,8-13,16-18 and 27-35 is/are rejected.
- 7) ☒ Claim(s) 3,7,14,15 and 19-26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I claims 1-35 in the reply filed on 6/23/2006 is acknowledged. The traversal is on the ground(s) that Groups I-VI are not independent and would not cause an undue burden of examination. This is not found persuasive because

- I. Claims 1-35 drawn to a method of making a MEMS-based fuel cell, classified in class 29, subclass 623.1.
- II. Claims 36-41, drawn to a method of making a MEMS-based fuel cell, classified in class 29, subclass 623.1
- III. Claims 42-49, drawn to a MEMS-based fuel cell, classified in class 429, subclass 88.
- IV. Claims 50-55, drawn to a manifold for a fuel cell, classified in class 429, subclass 72
- V. Claims 56-61, drawn to fuel cell with a combustor, classified in class 429, subclass 12.
- VI. Claims 62-64 drawn to a method of using a manifold, classified in class 429, subclass 12.

2. Inventions I, II, III and IV are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process

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(MPEP § 806.05(f)). In the instant case the manifold of the fuel cell can be made by another and materially different process such as chemical vapor disposition.

3. Inventions IV and VI are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product. See MPEP § 806.05(h). In the instant case the manifolds can be used in a materially different process such as mitigating the heat-resistance shock property of the cell.

4. Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

5. Because these inventions are independent or distinct for the reasons given above and the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

6. The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 7/28/2003 has been considered by the examiner.

Claim Objections

2. Claims 3 and 7 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

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Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The above identified claims do not further limit the method of fabrication presented in claim 1.

3. Claims 14, 15, 19-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. Claims 30, 32, 33, and 35 are objected to because of the following: it has been held that to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. *Ex parte Pfeiffer*, 1963 C.D. 408 (1961).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 30, 32, 33, and 35 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: actions necessary to “adapt” the openings for specified flow.

Claim Rejections - 35 USC § 103

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7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 4-6, 16, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski et al (US 2003/0039874). Jankowski teaches a MEMS-base thin-film fuel cell for electric power applications. There is a substrate with a porous membrane and the membrane has deposited and patterned onto it electrode-electrolyte-electrode layers (paragraph 32). The channels or chambers (30, 29) provide manifolds by which the fuel and oxidant are supplied. The manifolds extend the length of the anode and cathode (See Figure 1). The electrolyte may be constructed of a solid oxide or a proton exchange material (paragraph 7 and 49). These are well known types of fuel cells in the art.

9. It would have been obvious to one having ordinary skill in the art at the time of the invention to fabricate a fuel cell having a chamber with an integral manifold for controlled flow of the reactants through the fuel cell. The extension of the chamber over the entire anode maximizes the surface area available for the electrochemical reaction.

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10. Furthermore in regards to claim 16 and 17, the applicant has not asserted any criticality to the order of completion of the steps presented in claim 1. The results of completing the steps presented in claim 1 do not appear to be dependent upon order. The results of completing the steps of claim 1, regardless of the order do not appear to be patentably distinct.

11. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski as applied above, and further in view of Sasahara et al. (US 2002/0012825). Sasahara disclose a fuel cell with a patterned electrolyte/electrode interface. The patterned interface increases the surface area-to-volume ration (see abstract). The fuel cell provides enhanced volumetric power density. The patterns also provide channels by which the fuel cell reactants are directed from the inlet to the outlet of the fuel cell (paragraph 19). The sacrificial material is applied and then an electrolyte material is applied on the sacrificial material. Afterwards, the sacrificial material is removed by a suitable solvent (paragraph 19 and Figure 9A-9E). The sacrificial material used to create void regions or chambers within the electrolyte (paragraph 54) through which the reactants can pass.

10. It would have been obvious to one having ordinary skill in the art at the time of the invention to deposit and pattern the sacrificial material prior to the covering of it with an electrolyte roofing material. The passages formed from the removal of the sacrificial material allow for transport channels inside the cell. The electrolyte roofing material improves amount of surface area contact between the reactant and the electrolyte.

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11. Claims 9, 11, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski as applied above and furthermore, Jankowski teaches the forming of the porous electrode by photolithographic techniques (paragraph 44). The chamber roof is formed from the substrate material (see Fig. 1 and paragraph 33). The substrate material may be silicon (semi-conducting electrolyte material), ceramic, glass (non-electrolyte material), or plastic (claim 7). It is disclosed that the electrode should be porous enough to allow the fuel and oxidant to diffuse through to the electrolyte (paragraph 44 and claim 25). Various methods of making the electrode porous are stated such as etching or the use of a porous metallic sheet (paragraph 44). It would have been obvious to one having ordinary skill in the art at the time of the invention to form a porous electrode under the chamber to ensure proper diffusion of the reactant to the electrolyte. The use of electrolyte or non-electrolyte material in constructing the chamber provides better control of ionic activity of the cell for the given conditions.

12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski as applied above and further in view of Wortman et al. Wortman discloses that tape casting is a conventional method of forming electrode and electrolyte layers (paragraph 3). It would have been obvious to one having ordinary skill in the art at the time of the invention to use this well known method of tape casting to form the chamber. This method allows for ease of depositing and patterning components of a fuel cell.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski as applied above and further in view of Jacobson et al. (US 2004/0115503). Jacobson discloses an electrochemical device assembly. Tape calendaring or tape

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casting is a common method of used to fabricate thin films. Isopropanol and water are known solvents used in the processing of electrolyte solutions. It would have been obvious to one having ordinary skill in the art at the time of the invention to use water or isopropanol as the solvent in the tape casting process due to the fact that these solvents perform well in the electrolyte e depositing process.

Claims 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski. Jankowski disclose the removal of a substrate portions to form channels or chambers for the flow of the fuel cell reactants (see Fig. 1 and 2). Jankowski discloses that the manifolds can be used to supply reactants to the fuel cell or to transport exhaust gases away from the fuel cell (paragraph 38). It would have been obvious to one having ordinary skill in the art at the time of the invention to remove portions of the substrate to form openings that communicate with the chamber in order to supply material and exhaust material from the chamber.

Claims 31 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jankowski. Jankowski teaches the construction of an oxidant inlet, a fuel inlet, and internal channels **(220)** that communicate within the substrate (see paragraph 47). These openings are created by cutting away substrate material. The alignment or placement of the openings in relation to the chamber can be varied as necessary to properly stack the fuel cells (see paragraph 46 and Figure 8). It would have been obvious to one having ordinary skill in the art at the time of the invention to remove portions of the substrate to form openings that communicate with the chamber in order to supply material and exhaust material from the chamber.

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Schora et al. (US 5,077,148) teaches a fully internal manifolded and internal reformed fuel cell stack

Sasahara et al. (US 2002/0012825) teaches a fuel cell with patterned electrolyte/electrode interface

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (272) 571-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and alternating Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (272) 571-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


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